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ABSTRACT

This interim program of studies highlights technology learning outcomes for Kindergarten to Grade 12 students in Alberta (Canada). It forms the basis for the provincial program of studies to be released in June 2000. It identifies not only the outcomes that are already included in current programs of study, but also anticipates the knowledge, skills and attitudes that students will need to develop as technology continues to change rapidly. First, five underlying principles are outlined, followed by a curriculum overview identifying outcomes, categories of outcomes, and timelines. The body of the document details the outcome organization for the three categories, foundational operations, knowledge and concepts; processes for productivity; and communicating, inquiring, decision making and problem solving, and then lists student achievements in four divisions. Contains a glossary of terms. (AEF)

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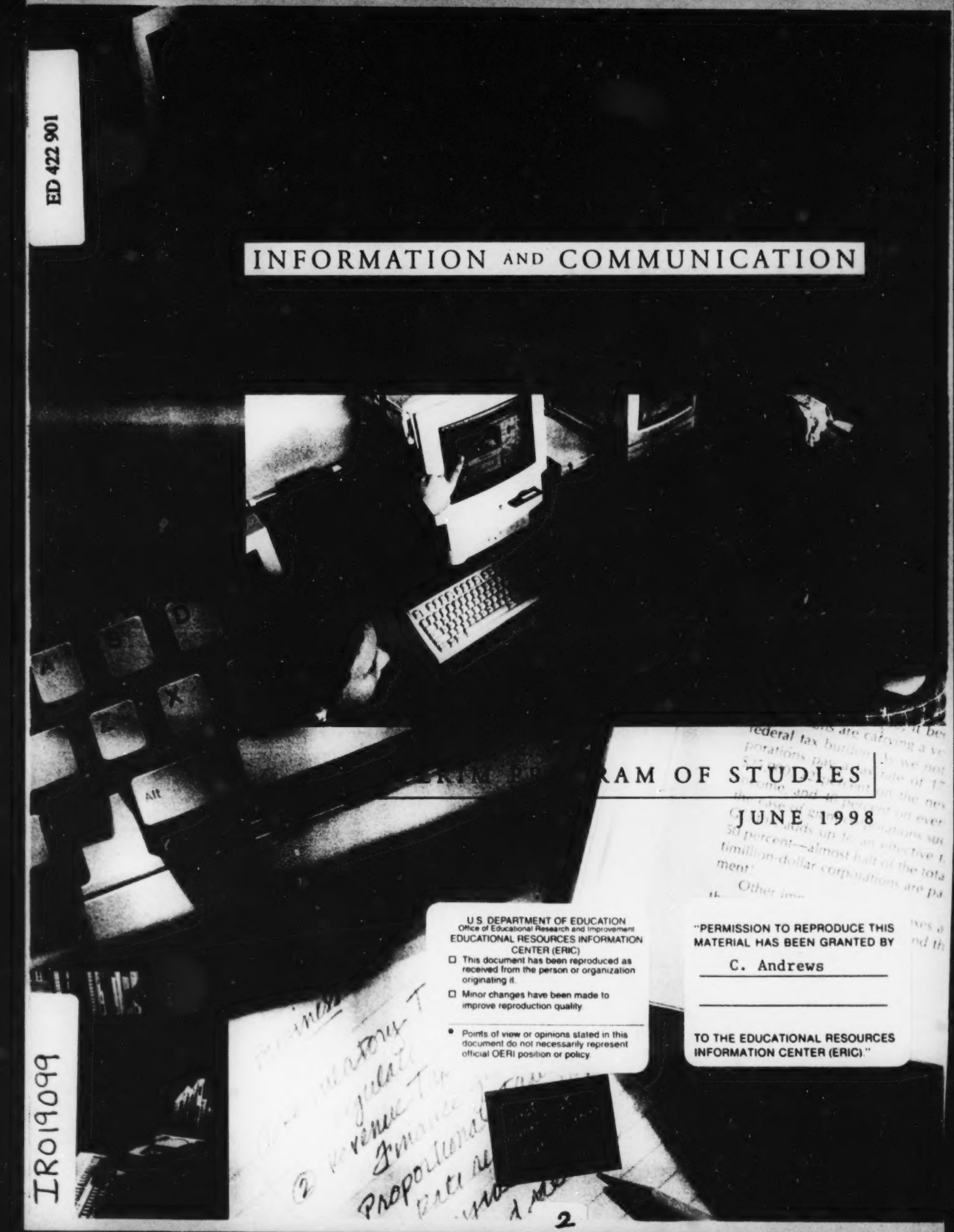

RAM OF STUDIES

JUNE 1998

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INFORMATION AND COMMUNICATION TECHNOLOGY

KINDERGARTEN TO GRADE 12

AN INTERIM PROGRAM OF STUDIES

JUNE 1998

Alberta Education

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The primary intended audience for this framework is:

Administrators	✔
Counsellors	
General Audience	✔
Parents	✔
Students	
Teachers	✔

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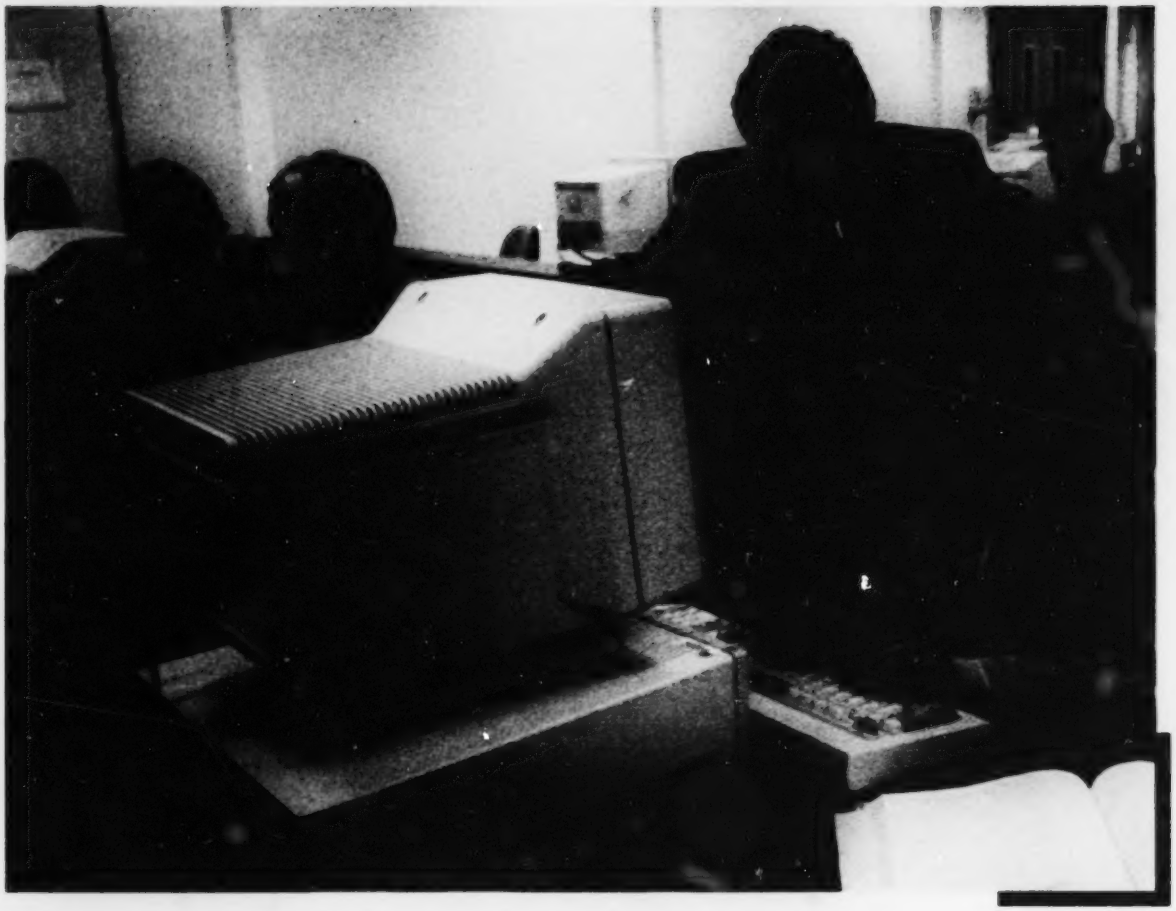

TABLE OF CONTENTS

Acknowledgements	iii
Introduction	1
Background	1
Developing a Curriculum for Learning	2
An Interim Program of Studies	3
Underlying Principles	4
Curriculum Overview	5
Organization	5
Outcomes	6
Timelines	6
Learner Outcomes in Information and Communication Technology	7
Outcome Organization	9
Foundational Operations, Knowledge and Concepts	11
Processes for Productivity	17
Communicating, Inquiring, Decision Making and Problem Solving	23
Glossary of Terms	30
Bibliography of Glossary	34

INTRODUCTION

Background

With respect to technology, students should have knowledge, skills and attitudes that will serve them well for entry-level work, for further study and for lifelong learning, and that will serve them well as they strive to become inquisitive, reflective, discerning and caring persons.

One of the distinguishing characteristics of human beings is our ability to make extensive use of tools and develop processes that make our lives easier. In earlier times, we found better ways to cook, hunt, gather food and travel. The technologies involved were primitive by today's standards, but they were nonetheless extremely important. They ensured our success and even our very existence.

We are still developing new technologies that have a significant impact on our daily lives: the mass production of goods and services, global communication, life-saving medical procedures and technology for use in industry, recreation, transportation and education. As well, some of our new technologies have the potential to reduce our security and invade our privacy. Nuclear arms, chemical warfare, land mines and electronic surveillance immediately come to mind.

Technology is more pervasive today than it ever has been. A whole array of tools, techniques and processes is enhancing and altering human activity. Technologies are enabling us to live, work and think in ways that most of us never dreamed were possible. For example, we now have access to electronic mail that instantly puts us in touch with relatives and friends across the globe, Internet shopping that allows us to "catalogue shop" anywhere, portable telephones that make us accessible even when we are not at home or in our offices, Internet- or network-based groupware that enables business colleagues and students to share documents and discuss projects from anywhere in the world at any time, and virtual offices and schools that have no buildings.

Technology is most importantly about thinking: communicating, inquiring, decision making and problem solving. It provides us with techniques and processes to think differently, to solve and resolve problems by using strategies that are "out of the box," to design new products or ideas, and to make informed, defensible decisions. In addition to other thinking processes, technology includes:

- gathering and identifying information
- classifying and organizing
- summarizing and synthesizing
- analyzing and evaluating
- speculating and predicting.

Technology helps us to think and do things differently. For example, teachers employ technology when they plan instruction that enables students to work co-operatively. Instructional design is a fundamental technology for educators. Business people use technology when they undergo "re-engineering" or adopt Total Quality Management. Trades people use technology when they develop a new process or tool to get a job done more efficiently or effectively. Government uses technology when it redesigns government services. In a society that is moving from an industrial economy to an information one, our students need to have technological skills for their future success.

Developing a Curriculum for Learning

Today, students must be prepared to understand, use and apply technologies in effective, efficient and ethical ways.

Technology has given us a capacity to provide education and training any place, any time, to anyone and in a variety of modes. Technology is causing the process of schooling to undergo phenomenal changes—both in the methods of delivery and in *how* people actually learn and teach.

The prominent role of technology in our lives today is also changing the curriculum—that is, *what* students learn. As always, young people need to acquire specific knowledge, skills and attitudes in order to become self-reliant, responsible, caring and contributing members of society. However, what they need to know and be able to do is constantly changing. Keeping the curriculum current is therefore an essential aspect of preparing students for the world of work, post-secondary studies, lifelong learning and citizenship in a complex world.

Today, students must be prepared to understand, use and apply technologies in effective, efficient and ethical ways. High school graduates are expected to be able to use information and communication technologies.

To begin addressing these needs and expectations, Alberta Education asked the question, "What should Alberta's students be learning with respect to technology?" In general terms, schools ensure that students are able to become productive citizens and contributing members of our society. With respect to technology, students should have knowledge and skills that will serve them well at entry-level work, for further study and lifelong learning and as inquisitive, reflective, discerning, and caring persons.

An extensive review of information from around the globe was conducted with a focus on the work being done by national education ministries, provincial and state ministries and school jurisdictions. Consultation with Alberta's employers, employees, parents, teachers and community members took place. A Framework document (a draft of the curriculum) was developed first. This Framework was reviewed by teachers, parents, business leaders, and the community-at-large. From this review an Information and Communication Technology Interim Program of Studies was developed.

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Students will be encouraged to grapple with the complexities, as well as the advantages and disadvantages, of technologies in our lives and workplaces.

An Interim Program of Studies

This interim curriculum document will form the basis for the provincial program of studies to be released in June 2000. Release of the interim document means that optional implementation may begin in the 1998–1999 school year in those schools that are ready. Other schools will continue to prepare themselves over the following two years. By September 2000, all schools must adopt this provincial program of studies. Many of Alberta's students already have acquired many of the competencies that this curriculum identifies but some will need instruction and the time to learn. Teachers will have an opportunity to diagnose the needs of their students and to prepare appropriate learning activities. Also, over the next two years Alberta Education intends to identify and authorize technology learning resources to help teachers implement the program of studies.

The interim program of studies highlights technology learning outcomes for Kindergarten to Grade 12 students in Alberta. It identifies not only the outcomes that are already included in current programs of study, but also anticipates the knowledge, skills and attitudes that students will need to develop as technology continues to change rapidly. This is a curriculum embedded within other curricula. It is a set of technology outcomes that are interrelated with subject-specific outcomes. It is not intended to be taught as a stand-alone course but rather to be infused within existing courses. Technology is best learned within a context of application. Activities, projects, and problems that replicate real-life situations are effective resources for learning technology. Existing programs, such as mathematics, language arts, science and social studies, as well as others, can provide rich contexts for technology.

This technology curriculum is intended to provide a broad perspective on the nature of technology and its impact on society. Students will be encouraged to grapple with the complexities, as well as the advantages and disadvantages, of technologies in our lives and workplaces.

UNDERLYING PRINCIPLES

The technology outcomes in this curriculum are limited to basic constructs relating primarily to *information* and *communication* technologies.

DISCUSSION: *Technology* is defined as the processes, tools and techniques that alter human activity. More specifically, the term "technology" is used to refer to a group of devices and systems that are used in processing, transferring and storing information and in communicating through electronic media.

***Most* students should learn and be able to demonstrate the technology outcomes included in this program of studies.**

DISCUSSION: Although the outcomes are designed for all students, some students will have individualized program plans that modify the expectations. Students who are physically or mentally challenged will need to use specific technologies that help them communicate, be mobile and/or learn. Many students may also choose to develop advanced technology knowledge and skills; for example, by taking Career and Technology Studies (CTS) courses.

The technology outcomes are framed as *exit outcomes*, that is, outcomes that students will be expected to demonstrate by the end of Divisions 1, 2, 3 and 4.

DISCUSSION: Learner expectations should be introduced at developmentally appropriate levels, and students may demonstrate achievement in a variety of grades. A set of illustrative examples has been developed to provide suggestions for grade and subject placement, but school staff may wish to develop a sequence that meets the needs of their students.

The outcomes are *progressive*: simple skills lead into more complex and higher-order skills.

DISCUSSION: Outcomes identified at early grade levels are not repeated in the text of the curriculum, but it is assumed these outcomes will be maintained and demonstrated through higher-order applications.

The technology outcomes reflect knowledge, skills and attitudes that will be further *defined* and *applied* within the context of most programs of study.

DISCUSSION: The technology outcomes are, in many instances, already embedded in a number of programs of study such as language arts, mathematics, science and social studies. Technology is being applied in many learning situations. For example, students are expected to use graphing calculators, word processors, problem-solving strategies or brainstorming techniques to accomplish specified tasks. Students are demonstrating technological proficiency as they apply a variety of technology skills or knowledge within programs. The context of the subject matter provides definition or clarification of the technology outcome.

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CURRICULUM OVERVIEW

The outcomes presented here:

- will be integrated in a variety of existing programs. Each of the outcomes needs a context to be meaningful. The development of word processing skills, for example, should be addressed within the context of communication. The illustrative examples provide suggestions for grade and subject placement
- should be introduced at appropriate grade levels, in keeping with the developmental readiness of students
- are described in developmental sequences through the divisions, and students will be asked to demonstrate their competencies at various points along the way
- should be considered holistically: the overall impact of instruction comes from the sum of the knowledge, skills and attitudes taken together
- have been written, to the extent that it is possible, as concepts as well as specific skills—concepts that can be applied to new applications as they evolve
- can also be found at the Alberta Education web site at <http://ednet.edc.gov.ab.ca/techoutcomes>.

ORGANIZATION

This curriculum presents the outcomes as three interrelated categories. First, there is a **foundation** of knowledge, skills, and attitudes that becomes more sophisticated as a student matures and grows. Next is a set of outcomes that address specific **productivity processes**, such as composing, organizing, manipulating, graphically displaying data and information, and using networks. These processes are then **applied** to give practical, contextualized experience in communicating, inquiring, decision making and problem solving.

The three key categories are:

Foundational Operations, Knowledge and Concepts

The **foundational operations, knowledge and concepts** outcomes include understanding the nature and impact of technology, the moral and ethical use of technology, mass media in a digitized context, ergonomic and safety issues, and basic computer, telecommunication, and multimedia technology operations.

Processes for Productivity

The **processes for productivity** outcomes focus on the knowledge and skills required to use a variety of basic productivity techniques and tools. These include text composition, data organization, graphical, audio and multimedia composition and manipulation, media and process integration, electronic communication navigation and collaboration through electronic means.

Communicating, Inquiring, Decision Making and Problem Solving

The **communicating, inquiring, decision making and problem solving** outcomes build on the foundational knowledge, skills and attitudes and the ability to use a variety of processes. These outcomes include the ability to critically assess information, manage inquiry, solve problems, use research techniques and communicate to a variety of audiences. These outcomes should be addressed in the context of subjects such as fine arts, language arts, mathematics, physical education, science and social studies. Students are expected to apply their knowledge and skills in real-life situations.

The outcomes presented are intended to be integrated within existing programs. Each of the outcomes needs a context within which to become meaningful.

Outcomes

The outcomes are described first in global or general terms. These are outcomes of "significance"; that is, they describe complex concepts and skills. Then more specific, detailed statements are provided to expand upon what is entailed in the general outcomes. However, the specific outcomes need to be addressed in the context of the related general outcome. The general outcomes specify domains of learning.

- **General Outcomes** are general statements that identify what students are expected to know, be able to do and value upon completion of an exit level.
- **Specific Outcomes** are statements identifying the component knowledge, skills and attitudes of a general outcome.

The outcomes are also supported by a set of **illustrative examples**.

- **Illustrative Examples** are sample tasks that demonstrate and elaborate on the general and specific outcomes. They are important in further clarifying the intent of the outcomes and in conveying how students might demonstrate their competencies in a variety of contexts and across all grade levels. These illustrative examples can be found at the Alberta Education web site at <http://ednet.edc.gov.ab.ca/techoutcomes>.

Timelines

Release of Information and Communication Technology Interim Program of Studies	June 1998
Optional implementation	September 1998
Release of Information and Communication Technology Program of Studies	June 2000
Implementation in all schools	September 2000

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LEARNER OUTCOMES IN INFORMATION AND COMMUNICATION TECHNOLOGY

KINDERGARTEN TO GRADE 12

Outcome Categories	General Outcomes
FOUNDATIONAL OPERATIONS, KNOWLEDGE AND CONCEPTS	**F1** Students will demonstrate an understanding of the nature of technology. **F2** Students will understand the role of technology as it applies to self, work and society. **F3** Students will demonstrate a moral and ethical approach to the use of technology. **F4** Students will become discerning consumers of mass media and electronic information. **F5** Students will practice the concepts of ergonomics and safety when using technology. **F6** Students will demonstrate a basic understanding of the operating skills required in a variety of technologies.
PROCESSES FOR PRODUCTIVITY	**P1** Students will compose, revise and edit text. **P2** Students will organize and manipulate data. **P3** Students will communicate through multimedia. **P4** Students will integrate various applications. **P5** Students will navigate and create hyperlinked resources. **P6** Students will use communication technology to interact with others.
COMMUNICATING, INQUIRING, DECISION MAKING AND PROBLEM SOLVING	**C1** Students will access, use and communicate information from a variety of technologies. **C2** Students will seek alternative viewpoints, using information technologies. **C3** Students will critically assess information accessed through the use of a variety of technologies. **C4** Students will use organizational processes and tools to manage inquiry. **C5** Students will use technology to aid collaboration during inquiry. **C6** Students will use technology to investigate and/or solve problems. **C7** Students will use electronic research techniques to construct personal knowledge and meaning.

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General Outcome	Specific Outcomes
F1 Students will demonstrate an understanding of the nature of technology.	**THE STUDENT WILL BE ABLE TO:**

DIVISION 1

- F1 1.1 identify techniques and tools for communicating, storing, retrieving and selecting information
- F1 1.2 apply terminology appropriate to the technologies being used at this division level
- F1 1.3 demonstrate an understanding that the user manages and controls the outcomes of technology

DIVISION 2

- F1 2.1 apply terminology appropriate to the technologies being used at this division level
- F1 2.2 identify and apply techniques and tools for communicating, storing, retrieving and selecting information
- F1 2.3 explain the advantages and limitations of using computers to store, organize, retrieve and select information
- F1 2.4 recognize the potential for human error when using technology

DIVISION 3

- F1 3.1 demonstrate an understanding that information can be transmitted through a variety of media
- F1 3.2 explain the concept of software and hardware compatibility
- F1 3.3 apply terminology appropriate to the technology being used at this division level
- F1 3.4 demonstrate an understanding that digital technology follows a logical order of operations
- F1 3.5 explain the difference between digital and analog data on communication systems
- F1 3.6 explain how the need for global communication will affect technology around the world
- F1 3.7 demonstrate the ability to troubleshoot technical problems
- F1 3.8 demonstrate an understanding that technology is a process, technique or tool used to alter human activity

DIVISION 4

- F1 4.1 assess the strengths and weaknesses of computer simulations in relation to real-world problems
- F1 4.2 solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments
- F1 4.3 apply terminology appropriate to technology in all forms of communication
- F1 4.4 demonstrate an understanding of the general concepts of computer programming and the algorithms that enable technological devices to perform operations and solve problems

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General Outcome	Specific Outcomes
F2 Students will understand the role of technology as it applies to self, work and society.	**THE STUDENT WILL BE ABLE TO:** **DIVISION 1** F2 1.1 identify technologies used in everyday life F2 1.2 describe particular technologies being used for specific purposes **DIVISION 2** F2 2.1 identify how technological developments influence his or her life F2 2.2 identify the role technology plays in a variety of careers F2 2.3 examine the environmental issues related to the use of technology F2 2.4 assess the personal significance of having limitless access to information provided by communication networks, such as the Internet F2 2.5 describe, using examples, how communication and information networks, such as the telephone and the Internet, create a global community **DIVISION 3** F2 3.1 describe the impact of communication technologies on past, present and future workplaces, lifestyles and the environment F2 3.2 identify potential technology-related career paths F2 3.3 identify the cultural impact of global communication F2 3.4 evaluate the driving forces behind various technological inventions F2 3.5 make inferences regarding future trends in the development and impact of communication technologies F2 3.6 explain ways in which technology can assist in the monitoring of local and global environmental conditions F2 3.7 analyze and assess the impact on society of having limitless access to information F2 3.8 identify the manner in which telecommunications technology affects time and distance **DIVISION 4** F2 4.1 use technology outside formal classroom settings F2 4.2 analyze how technological innovations and creativity affect the economy F2 4.3 demonstrate an understanding of new and emerging communication systems F2 4.4 evaluate possible potential for emerging technologies F2 4.5 demonstrate conservation measures when using technology F2 4.6 demonstrate the consumer knowledge necessary to make purchases, such as a computer, modem, VCR and video camera F2 4.7 use current, reliable information sources from around the world F2 4.8 analyze and assess the impact of technology on the global community

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General Outcome	Specific Outcomes
F3 Students will demonstrate a moral and ethical approach to the use of technology.	**THE STUDENT WILL BE ABLE TO:**

DIVISION 1

- F3 1.1 demonstrate courtesy and follow classroom procedures when making appropriate use of computer technologies
- F3 1.2 work collaboratively to share limited resources
- F3 1.3 demonstrate appropriate care of technology equipment
- F3 1.4 recognize and acknowledge the ownership of electronic material
- F3 1.5 use appropriate communication etiquette

DIVISION 2

- F3 2.1 comply with the acceptable use policy of the school and district for Internet and networked services, including software licensing agreements
- F3 2.2 work collaboratively to share limited resources
- F3 2.3 use appropriate communication language and etiquette
- F3 2.4 document sources obtained electronically, such as web site addresses
- F3 2.5 respect the privacy and products of others
- F3 2.6 use electronic networks in an ethical manner
- F3 2.7 comply with copyright legislation

DIVISION 3

- F3 3.1 use time and resources on the network wisely
- F3 3.2 explain the issues involved in balancing the right to access information with the right to personal privacy
- F3 3.3 understand the need for copyright legislation
- F3 3.4 cite sources when using copyright and/or public domain material
- F3 3.5 download and transmit only materials that comply with the established network use policies and practices
- F3 3.6 model and assume personal responsibility for ethical behaviour and attitudes and acceptable use of information technologies and sources in local and global contexts

DIVISION 4

- F3 4.1 demonstrate an understanding of how changes in technology can benefit or harm society
- F3 4.2 record relevant data for acknowledging sources of information and cite sources correctly
- F3 4.3 respect ownership and integrity of information

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General Outcome	Specific Outcomes
F4 Students will become discerning consumers of mass media and electronic information.	**THE STUDENT WILL BE ABLE TO:** **DIVISION 1** F4 1.1 compare similar types of information from two different electronic sources **DIVISION 2** F4 2.1 recognize that graphics, video and sound enhance communication F4 2.2 describe how the use of various texts and graphics can alter perception F4 2.3 discuss how technology can be used to create special effects and/or to manipulate intent through the use of images and sound **DIVISION 3** F4 3.1 identify aspects of style in a presentation F4 3.2 understand the nature of various media and how they are consciously used to influence an audience F4 3.3 identify specific techniques used by the media to elicit particular responses from an audience F4 3.4 recognize that the ability of technology to manipulate images and sound can alter the meaning of a communication **DIVISION 4** F4 4.1 discriminate between style and content in a presentation F4 4.2 evaluate the influence and results of digital manipulation on our perceptions F4 4.3 identify and analyze a variety of factors that affect the authenticity of information derived from mass media and electronic communication

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General Outcome	Specific Outcomes
F5 Students will practice the concepts of ergonomics and safety when using technology.	**THE STUDENT WILL BE ABLE TO:** **DIVISION 1** F5 1.1 demonstrate proper posture when using a computer F5 1.2 demonstrate safe behaviours when using technology **DIVISION 2** F5 2.1 demonstrate the application of ergonomics to promote personal health and well-being F5 2.2 identify and apply safety procedures required for the technology being used **DIVISION 3** F5 3.1 identify risks to health and safety that result from improper use of technology F5 3.2 identify and apply safety procedures required for the technology being used **DIVISION 4** F5 4.1 assess new physical environments with respect to ergonomics F5 4.2 identify safety regulations specific to the technology being used

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General Outcome	Specific Outcomes
F6 Students will demonstrate a basic understanding of the operating skills required in a variety of technologies.	**THE STUDENT WILL BE ABLE TO:**

DIVISION 1

- F6 1.1 perform basic computer operations (which may vary by environment), including powering up, inserting disks, moving the cursor, clicking on an icon, using pull-down menus, executing programs, saving files, retrieving files, printing, ejecting disks and powering down
- F6 1.2 use keyboarding techniques for the home row, enter, space bar, tab, backspace, delete and insertion-point arrow keys
- F6 1.3 operate basic audio and video equipment, including inserting, playing, recording and ejecting media

DIVISION 2

- F6 2.1 power up and power down various technologies and peripherals correctly
- F6 2.2 use and organize files and directories
- F6 2.3 use peripherals, including printers and scanners
- F6 2.4 use appropriate keyboarding techniques for the alphabetic and punctuation keys

DIVISION 3

- F6 3.1 connect and use audio, video and digital equipment
- F6 3.2 perform routine data maintenance and management of personal files
- F6 3.3 demonstrate proficiency in uploading and downloading text, image, audio and video files
- F6 3.4 demonstrate the ability to control devices electronically
- F6 3.5 describe the steps involved in loading software
- F6 3.6 identify and apply safety procedures, including anti-virus scans and virus checks, to maintain data integrity

DIVISION 4

- F6 4.1 continue to demonstrate the learner outcomes addressed within the previous divisions. Students interested in pursuing advanced study in areas such as electronics, programming, CADD, robotics and other industrial applications of technology will find opportunities in CTS modules.

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General Outcome	Specific Outcomes
PI Students will compose, revise and edit text.	**THE STUDENT WILL BE ABLE TO:**

DIVISION 1

- PI 1.1 create original text, using word processing software, to communicate and demonstrate understanding of forms and techniques
- PI 1.2 edit complete sentences, using such features of a word processor as cut, copy and paste

DIVISION 2

- PI 2.1 create and revise original text to communicate and demonstrate understanding of forms and techniques
- PI 2.2 edit and format text to clarify and enhance meaning, using such word processing features as the thesaurus, find/change, text alignment, font size and style
- PI 2.3 convert digital text files by opening and saving them as different file types

DIVISION 3

- PI 3.1 design a document, using style sheets and with attention to page layout, that incorporates advanced word processing techniques, including headers, footers, margins, columns, table of contents, bibliography and index
- PI 3.2 use advanced menu features within a word processor to accomplish a task; for example, insert a table, graph or text from another document
- PI 3.3 revise text documents based on feedback from others
- PI 3.4 use appropriate communication technology to elicit feedback from others

DIVISION 4

- PI 4.1 continue to demonstrate the learner outcomes achieved in prior grades and course subjects.

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General Outcome	Specific Outcomes
P2 Students will organize and manipulate data.	**THE STUDENT WILL BE ABLE TO:** **DIVISION 1** P2 1.1 read information from a prepared database **DIVISION 2** P2 2.1 enter and manipulate data by using such tools as a spreadsheet or database for a specific purpose P2 2.2 display data electronically through graphs and charts **DIVISION 3** P2 3.1 design, create and modify a database for a specific purpose P2 3.2 design, create and modify a spreadsheet for a specific purpose, using functions such as SUM, PRODUCT, QUOTIENT, and AVERAGE P2 3.3 use a variety of technological graphing tools to draw graphs for data involving one or two variables P2 3.4 use a scientific calculator or a computer to solve problems involving rational numbers **DIVISION 4** P2 4.1 manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets

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General Outcome	Specific Outcomes
P3 Students will communicate through multimedia.	**THE STUDENT WILL BE ABLE TO:**

DIVISION 1

- P3 1.1 access images, such as clip art, to support communication
- P3 1.2 create visual images by using such tools as paint and draw programs for particular audiences and purposes
- P3 1.3 access sound clips or recorded voice to support communication

DIVISION 2

- P3 2.1 create a multimedia presentation, incorporating such features as visual images (clip art, video clips), sounds (live recordings, sound clips) and animated images, appropriate to a variety of audiences and purposes
- P3 2.2 access available databases for images to support communication

DIVISION 3

- P3 3.1 create multimedia presentations that take into account audiences of diverse size, age, gender, ethnicity and geographic location
- P3 3.2 create multimedia presentations that incorporate meaningful graphics, audio, video and text gathered from remote sources

DIVISION 4

- P3 4.1 select and use, independently, multimedia capabilities for presentations in various subject areas
- P3 4.2 support communication with appropriate images, sounds and music
- P3 4.3 apply general principles of graphic layout and design to a document in process

General Outcome	Specific Outcomes
P4 Students will integrate various applications.	**THE STUDENT WILL BE ABLE TO:**
	DIVISION 1
	P4 1.1 integrate text and graphics to form a meaningful message
	P4 1.2 balance text and graphics for visual effect
	DIVISION 2
	P4 2.1 integrate a spreadsheet, or graphs generated by a spreadsheet, into a text document
	P4 2.2 vary font style and size, and placement of text and graphics, in order to create a certain visual effect
	DIVISION 3
	P4 3.1 integrate information from a database into a text document
	P4 3.2 integrate database reports into a text document
	P4 3.3 emphasize information, using placement and colour
	DIVISION 4
	P4 4.1 integrate a variety of visual and audio information into a document to create a message targeted for a specific audience
	P4 4.2 apply principles of graphic design to enhance meaning and audience appeal
	P4 4.3 use integrated software effectively and efficiently to reproduce work that incorporates data, graphics and text

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General Outcome	Specific Outcomes
P5 Students will navigate and create hyperlinked resources.	**THE STUDENT WILL BE ABLE TO:** **DIVISION 1** P5 1.1 navigate within a document, compact disc or other software program that contains links P5 1.2 access hyperlinked sites on an intranet or the Internet **DIVISION 2** P5 2.1 create and navigate a multiple-link document P5 2.2 navigate through a document that contains links to locate, copy and then paste data in a new file P5 2.3 navigate the Internet with appropriate software **DIVISION 3** P5 3.1 create a multiple-link web page P5 3.2 demonstrate proficient use of various information retrieval technologies **DIVISION 4** P5 4.1 create multiple-link documents appropriate to the content of a particular topic P5 4.2 post multiple-link pages on the World Wide Web or on a local or wide area network

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General Outcome	Specific Outcomes
P6 Students will use communication technology to interact with others.	**THE STUDENT WILL BE ABLE TO:** **DIVISION 1** P6 1.1 compose a message that can be sent through communication technology P6 1.2 communicate electronically with people outside the classroom **DIVISION 2** P6 2.1 select and use the technology appropriate to a given communication situation **DIVISION 3** P6 3.1 communicate with a targeted audience, within a controlled environment, by using communication technologies, such as e-mail and web browsers P6 3.2 demonstrate proficiency in accessing local area network, wide area network and Internet services, including uploading and downloading text, image, audio and video files **DIVISION 4** P6 4.1 select and use the appropriate technologies to communicate effectively with a targeted audience

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General Outcome	Specific Outcomes
C1 Students will access, use and communicate information from a variety of technologies.	**THE STUDENT WILL BE ABLE TO:** **DIVISION 1** C1 1.1 access and retrieve appropriate information from electronic sources for a specific inquiry C1 1.2 process information from more than one source to retell what has been discovered **DIVISION 2** C1 2.1 access and retrieve appropriate information from the Internet by using a specific search path or from given uniform resource locations (URLs) C1 2.2 organize information gathered from the Internet or an electronic source by selecting and recording the data in logical files or categories C1 2.3 communicate effectively, through appropriate forms, such as speeches, reports and multimedia presentations, applying information technologies that serve particular audiences and purposes **DIVISION 3** C1 3.1 plan and conduct a search, using a wide variety of electronic sources C1 3.2 refine searches to limit sources to a manageable number C1 3.3 access and operate multimedia applications and technologies from stand-alone and online sources C1 3.4 access and retrieve information through the electronic network C1 3.5 analyze and synthesize information to create a product C1 3.6 communicate in a persuasive and engaging manner, through appropriate forms, such as speeches, letters, reports and multimedia presentations, applying information technologies for content, audience and purpose **DIVISION 4** C1 4.1 plan and perform complex searches, using more than one electronic source C1 4.2 select information from appropriate sources, including primary and secondary sources C1 4.3 evaluate and explain the advantages and disadvantages of various search strategies C1 4.4 communicate in a persuasive and engaging manner, through appropriate forms, such as speeches, letters, reports and multimedia presentations, applying information technologies for context, audience and purpose that extend and communicate understanding of complex issues

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General Outcome	Specific Outcomes
C2 Students will seek alternative viewpoints, using information technologies.	**THE STUDENT WILL BE ABLE TO:** **DIVISION 1** [no outcomes for this division] **DIVISION 2** C2 2.1 seek responses to inquiries from various authorities through electronic media **DIVISION 3** C2 3.1 access diverse viewpoints on particular topics by using appropriate technologies C2 3.2 assemble and organize different viewpoints in order to assess their validity C2 3.3 use information technology to find facts that support or refute diverse viewpoints **DIVISION 4** C2 4.1 consult a wide variety of sources that reflect varied viewpoints on particular topics C2 4.2 evaluate the validity of gathered viewpoints against other sources

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General Outcome	Specific Outcomes
C3 Students will critically assess information accessed through the use of a variety of technologies.	**THE STUDENT WILL BE ABLE TO:** **DIVISION 1** C3 1.1 compare and contrast information from similar types of electronic sources **DIVISION 2** C3 2.1 identify and distinguish points of view expressed in electronic sources on a particular topic C3 2.2 recognize that information serves different purposes and that data from electronic sources may need to be verified to determine accuracy or relevance for the purpose used **DIVISION 3** C3 3.1 evaluate the authority and reliability of electronic sources C3 3.2 evaluate the relevance of electronically accessed information to a particular topic **DIVISION 4** C3 4.1 assess the authority, reliability and validity of electronically accessed information C3 4.2 demonstrate discriminatory selection of electronically accessed information that is relevant to a particular topic

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General Outcome	Specific Outcomes
C4 Students will use organizational processes and tools to manage inquiry.	**THE STUDENT WILL BE ABLE TO:** **DIVISION 1** C4 1.1 follow a plan to complete an inquiry C4 1.2 formulate new questions as research progresses C4 1.3 organize information from more than one source **DIVISION 2** C4 2.1 design and follow a plan, including a schedule, to be used during an inquiry process, and make revisions to the plan as necessary C4 2.2 organize information, using such tools as a database, spreadsheet or electronic webbing C4 2.3 reflect on and describe the processes involved in completing a project **DIVISION 3** C4 3.1 create a plan for an inquiry that includes consideration of time management C4 3.2 develop a process to manage volumes of information that can be available through electronic sources C4 3.3 demonstrate the advanced search skills necessary to limit the number of hits desired for online and offline databases; for example, the use of "and" or "or" between search topics and the choice of appropriate search engines for the topic **DIVISION 4** C4 4.1 use calendars, time management or project management software to assist in conducting an inquiry

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General Outcome	Specific Outcomes
C5 Students will use technology to aid collaboration during inquiry.	**THE STUDENT WILL BE ABLE TO:** **DIVISION 1** C5 1.1 share information collected from electronic sources to add to a group task **DIVISION 2** C5 2.1 retrieve data from available storage devices, such as a shared folder, to which a group has contributed C5 2.2 record group brainstorming, planning and sharing of ideas by using technology C5 2.3 extend the scope of a project beyond classroom collaboration by using communication technologies, such as the telephone and e-mail **DIVISION 3** C5 3.1 access, retrieve and share information from electronic sources, such as common files C5 3.2 use networks to brainstorm, plan and share ideas with group members **DIVISION 4** C5 4.1 use telecommunications to pose critical questions to experts C5 4.2 participate in a variety of electronic group formats

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General Outcome

C6 Students will use technology to investigate and/or solve problems.

Specific Outcomes

THE STUDENT WILL BE ABLE TO:

DIVISION 1

- C6 1.1 identify a problem within a defined context
- C6 1.2 use technology to organize and display data in a problem-solving context
- C6 1.3 use technology to support and present conclusions

DIVISION 2

- C6 2.1 select and use technology to assist in problem solving
- C6 2.2 use data gathered from a variety of electronic sources to address identified problems
- C6 2.3 use graphic organizers, such as mind mapping/webbing, flow charting and outlining, to present connections among ideas and information in a problem-solving environment
- C6 2.4 solve problems, using numerical operations and such tools as calculators and spreadsheets
- C6 2.5 solve problems requiring the sorting, organizing, classifying and extending of data, using such tools as calculators, spreadsheets, databases or hypertext technology
- C6 2.6 solve issue-related problems, using such communication tools as a word processor or e-mail to involve others in the process
- C6 2.7 generate alternative solutions to problems by using technology to facilitate the process

DIVISION 3

- C6 3.1 articulate clearly a plan of action to use technology to solve a problem
- C6 3.2 identify the appropriate materials and tools to use in order to accomplish a plan of action
- C6 3.3 evaluate choices and the progress in problem solving, then redefine the plan of action as appropriate
- C6 3.4 pose and test solutions to problems by using computer applications, such as computer-assisted design or simulation/modelling software
- C6 3.5 create a simulation or a model by using technology that permits the making of inferences

DIVISION 4

- C6 4.1 investigate and solve problems of prediction, calculation and inference
- C6 4.2 investigate and solve problems of organization and manipulation of information
- C6 4.3 manipulate data by using charting and graphing technologies in order to test inferences and probabilities
- C6 4.4 generate new understandings of problematic situations by using some form of technology to facilitate the process
- C6 4.5 evaluate the appropriateness of the technology used to investigate or solve a problem

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General Outcome	Specific Outcomes
C7 Students will use electronic research techniques to construct personal knowledge and meaning.	**THE STUDENT WILL BE ABLE TO:** **DIVISION 1** C7 1.1 develop questions that reflect a personal information need C7 1.2 summarize data by picking key words from gathered information and by using jottings, point form or retelling C7 1.3 draw conclusions from organized information C7 1.4 make predictions based on organized information **DIVISION 2** C7 2.1 use a variety of technologies to organize and synthesize researched information C7 2.2 use selected presentation tools to demonstrate connections among various pieces of information **DIVISION 3** C7 3.1 identify patterns in organized information C7 3.2 make connections among related, organized data, and assemble various pieces into a unified message **DIVISION 4** C7 4.1 use appropriate strategies to locate information to meet personal needs C7 4.2 analyze and synthesize information to determine patterns and links among ideas C7 4.3 use appropriate presentation software to demonstrate personal understandings

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GLOSSARY OF TERMS

Algorithm	Sequence of steps for solving a problem.
Analog	Used to describe a continuous variable signal, as opposed to a discrete or "digital" one, or a circuit designed to handle such signals.
Analog communication	Any system that uses a nominally continuous signal.
Asynchronous communication	Not synchronous; not occurring at predetermined or regular intervals. E-mail is an asynchronous form of communication.
Binary	A numbering system consisting only of zeroes and ones.
Bookmark	A feature found in web browsers that allows users to keep track of sites to which they wish to return.
Browser	An application used to locate and display web pages; short for "web browser."
Chat	Real-time, text-based communication between two or more users, via computer.
Communication technology	Concerned with the tools and processes used to transmit data from one device to another.
Convert files	To move data from one type of storage to another.
Copy	An operating system function that lets the user duplicate information from one application or location to another.
CTS	Career and Technology Studies
Cursor	A special symbol, usually a solid rectangle or a blinking underscore character, that signifies where the next character will be displayed on the screen.
Cut	To remove text or graphics as part of a cut and paste process.
Database	An electronic filing system.
Database Management System (DBMS)	A collection of utilities that allows the user to query and manipulate a database.
Digital	Describes a signal in which numerical values are broken up into a binary equivalent and transmitted as a sequence of on/off values.
Digital communication	Any communication system that uses digital signals in the sending and receiving of messages.
Digital information	Information that is in a computer-readable form.
Directory	A hierarchical tree-like structure used for organizing information.
Document	A file created with a word processor.

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Download	The process of transferring a computer file from a remote computer to a local computer.
Electronic bulletin board	An electronic message centre. It allows an individual to review messages left by others and to post messages if desired.
E-mail	Electronic mail. A service that permits users to electronically exchange messages and data. E-mail can be used to send text as well as computer files, such as word processing documents or graphics.
Ergonomics	The study of physical and mental factors that affect people in work settings; used in the design of work sites, work processes, and so on; e.g., the design of computer work stations so that users will have minimal strain on posture and vision.
File	A collection of data defined and used by an application.
Flow chart	A diagram that shows the steps involved in solving a problem. This is often used by programmers to plan the flow of logic in a program.
Font	The complete assortment of characters for one style of a particular typeface.
Grammar checker	A feature for checking the grammatical soundness of text, either as it is being keyed in, or later, at the user's discretion.
Graphic	A pictorial form of information.
Hit	A single file served by a web server. Images are files, as is the document text describing the page.
Home row	The row of keys on the keyboard where users rest their fingers between keystrokes.
Hyperlink	On web pages, a button or highlighted bit of text that, when selected, moves the reader to a different place within a document, to another document or to another web site.
Hypertext	Text that contains links to other text documents.
Icon	A picture displayed on a computer screen to represent a commonly used function or concept.
Information technology	The broad subject concerned with the processes and tools used to send, retrieve, store, manipulate and manage information.
Internet	A worldwide network of computer networks.
Intranet	A collection of private web sites and other network resources that are available only to employees, or other trusted parties within an organization.
LAN	A Local Area Network. A computer network usually confined to a single office or building.
Laser disk	A mass storage device that can store large amounts of digital information. Often used to store digital video data.

Login	Enter into a computer network or application session.
Logout	To end a computer session.
Mail merge	A function that lets users merge information from a database into documents composed on a word processor.
Mass media	Any means of public communication reaching a large audience.
Menu	A list of options for a person using a piece of software.
Mind mapping	A knowledge organization tool used to elicit ideas from one or more users by placing a topic in the centre of a blank space and branching out with related ideas.
Multimedia	Use of text, graphics, video, animation, sound, etc., in an integrated way.
Navigate	Any or all of the various processes used in determining position and differing movement from one place to another.
Network	A linked set of computers and computer equipment.
Network etiquette	The traditional rules of civilized behaviour online, commonly referred to as "netiquette."
News groups	Online discussion forums where ideas and information can be exchanged.
Offline	Not currently connected to a network.
Online database	A database that is accessible to many users via the Internet.
Paste	To insert a copy at an insertion point.
Peripheral	Any device, such as input, output, or storage, that is connected to a computer.
Platform	A type of computer or system.
Printer	An output device that converts the coded information from the processor into a readable form on paper.
Program	An application run on a computer.
Public domain	Not bearing copyright; any product in the public domain can be freely exchanged and copied.
Query	A request for information from a database.
Retrieve	The process of extracting data from a computer.
Scanner	A device that can read text or illustrations printed on paper and translate the information into a form a computer can use.
Search path	Description of how to find a subdirectory or file by identifying its location with respect to a disk or drive's root directories.
Software	An application run on a computer, synonymous with "program."
Spell checker	Software that checks the spelling of all words in a document.

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Spreadsheet	A software calculating tool that helps people plan, manage data and present results. Similar in many ways to an accountant's ledger.
Storage device	A device that can receive data and retain it for subsequent retrieval.
Storyboard	A board or panel containing a series of small drawings or sketches that roughly depict the sequence of action for a script to be filmed, as for a motion picture, television commercial, music video or the like.
Synchronous	Two-way communication; a person using synchronous communication could send and receive data at the same time.
Technology	The processes, tools and techniques that alter human activity. The application of scientific knowledge for practical purposes; the employment of tools, machines, materials and processes to do work, produce goods, perform services or carry out other useful activities.
Telecommunication	Any process or group of processes that allows for the relay of printed or written matter, moving or fixed pictures, or other visible or audible signals.
Text	In word processing, the portion of a file that will be readable on a screen or printed page, sometimes including incidentals, such as headers.
URL	A Uniform Resource Locator. A web address. It consists of a protocol, a hostname, a port (optional), a directory (optional), and a file name (optional).
Upload	The process of transferring a computer file from a user's system to a remote system.
WAN	A Wide Area Network. A computer network spanning a wide geographical area.
Web page	A hypertext document on the web.
Window	A rectangular area on a display screen inside of which part of an image or file is displayed. A windows system is a means of presenting users with views of the state of a number of separate processes, each carrying out a task for the user. The user is able to initiate, monitor and terminate processes, each process having an associated window.
Word processing	A computer software writing tool.
World Wide Web	A collection of hypertext documents and associated files linked together over the Internet.

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